

Topics and Epistemological Trends in Swedish Bachelor Theses in Radiography

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Abstract

When investigating the general state of radiography, an allied health care education in Sweden, one possible starting point is to conduct a review of Bachelor theses from radiography education programmes. The nature and function of the thesis can have an academic or professional perspective or a combination of both. The review of the theses can give insight into both the current state and the future of radiography. The aim of this study was to explore the contemporary theoretical, topical and methodological trends in Bachelor theses in the field of radiography. An explorative design with a qualitative approach using content analysis was employed to determine the addressed theoretical framework, topics, research questions, and designs and methods used in Bachelor theses in radiography. The theoretical framework gave the impression of a discipline with a great deal of imported knowledge, showing a theoretical pluralism. The analysis of research questions yielded four topics: evidence based care, evidence behind imaging, work environment and additional minor trends. The research designs used, involve literature review of other research and interviews. The students use qualitative, quantitative and mixed methods, whereas quality content analysis holds an exceptional position for analysis. Academically oriented theses should focus on knowledge of the subject, and it can therefore be claimed that the analysis of Bachelor theses provides a window into the state of radiography and can thereby have an impact on the development of radiography as a discipline.

Keywords

Radiography, Bachelor Theses, Explorative Design, Content Analysis

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1. Introduction

When investigating the general state of the allied health care education of radiography in Sweden, a potential starting point is to conduct a review and examine Bachelor theses from radiography education programmes. While radiography and the allied health care professions have changed beyond recognition over the last century, only entering the university sector in the 1990s, radiography is still relatively young in academic terms (Snaith, 2013). Radiography is still in need of developing and identifying theoretical and methodological views of the discipline in order to clarify the research interests and perspectives, and sharpen the philosophical arguments for justifying radiography as an independent academic discipline (Ahonen & Liikanen, 2009). This article is based on data obtained about Bachelor theses on radiography in Sweden. The article explores and summarizes trends in scholarship among students completing Bachelor theses in radiography education. In Sweden, a degree in radiography became possible 2001 in connection with a university reform and has been organized according to the European two-tier degree system, consisting of Bachelor's and Master's degrees. The Radiography Education Program covers three years post-secondary education, comprising 180 European Credit Transfer and Accumulation System credits (ECTS) and must, as every other university education in Sweden, be founded on a scientific basis. Attainment of a degree requires a thesis, and a graduate exiting the radiography programme obtains both the academic excellence and professional competence levels expected by the Swedish national agency for higher education (The Swedish National Agency for Higher Education's Quality Evaluation System 2011-2014).

Writing theses and academic papers has long been recognized as an essential skill university students need to master (Gimenez, 2012). In line with the intention and guidelines according to first cycle's education in the Bologna process, the requirement for undergraduate degree is to promote independent and critical judgment and to develop the student's ability for information exchange at a scientific level (SFS, 1993: 100. Higher Education Ordinance). A Bachelor level thesis is a compulsory part of the Swedish radiographic programs and is usually performed during the latter part of the education. The thesis is an essay concerning issues related to a disciplinary program. It has a central role in education: it marks a transition in status for the graduate student to a member of the scientific community, encourages familiarity with the research process, and allows evaluation of the quality of the education. This evaluation of Bachelor theses will also examine the extent to which the student has acquired the knowledge necessary for her or him to understand, interpret, analyse and explain scientific and/or clinical aspects of a given professional field (Lundgren & Robertsson, 2013). Its two most vital functions are to provide research training and, through deeper studies, prepare the student for their professional career.

2. Literature Review

An extensive literature analysis of the nature and function of the thesis has been made, and it was found that the thesis distinguishes itself as essentially an academic or professional project or a combination of both (Svärd, 2013). The academic project focuses on knowledge of the subject, and the student is expected to be a subject specialist and to obtain scientific expertise and research skills. The project is expected to be scientific and have a pre-research function, but with a low application level. Since the theses with an academic orientation should emphasise the essential terms of science—research, theory, analysis and criticism—the professional orientation should emphasise activity, professional relevance and career preparation. The conclusion is that the two orientations are fundamentally different, which causes internal tensions in the relationship between the two (Svärd, 2013).

Studies that have investigated Bachelor theses are mainly from professional programmes such as the teaching and nursing disciplines (Svärd, 2014; Meeus et al, 2004). Theses have been studied from different aspects, such as quality, competence, learning and content. Studies of theses in health care have measured quality of education (Kapborg & Berterö, 2002), compared grading between examiners and supervisors of Bachelor theses in nursing education (Lundgren et al., 2008), students' expectations of writing a thesis (Lundgren and Halvarsson, 2009) and health care students' conceptions of group supervision during work with Bachelor theses (Kangasniemi et al., 2011). Trends in theses in the area of distance education and combination of learning and social work education have been explored and summarized to determine the topics addressed and the designs and methods used to explore the theoretical foundations of the discipline (Drysdale et al., 2013; Davies et al., 2010; Dellgran & Höjer, 2003). Svärd (2014) investigated whether an assessment of quality of a degree project can be used to evaluate an entire programme. On the basis of the extended literature analysis of theses, the conclusion is that the area is poorly researched (Gimenez, 2012) and a uniform pattern of what has been studied cannot be seen (Svärd, 2014;

Lundgren et al., 2008). One study showed that nursing students who engaged in academic writing as part of their Bachelor's degree considered it as a learning experience and developed more insight into their own professional strengths and weaknesses (Lundgren & Halvarsson, 2009).

There have been attempts in the past decade to describe and clarify radiography as a discipline and to explore the theoretical foundation of radiography (Ahonen, 2008; Lundgren & Furåker, 2014; Lundgren et al., 2015). What radiography means as a subject in radiographic programs was investigated by analysing programs' curricula and syllabi. The authors found that radiography as a subject was grouped under health sciences and was believed to be similar to other health sciences such as nursing. However, radiography, with its roots in both the natural sciences and humanistic sciences, seems to deal with knowledge in a rather different way than for example nursing. In radiography, where several different fields of knowledge are grouped together in an inter-disciplinary mixture, which can cause a tension between these fields of knowledge (Gimenez, 2012; Lundgren & Furåker, 2014).

Other efforts have been made to define radiography. Ahonen (2008) studied radiography from a theoretical perspective and found that it is by nature dualistic, dynamic, social and situation-related. Additional actions have been taken to describe radiography based on students' understanding of the concept. The study showed that students highlighted the humanistic aspects and the interdisciplinary nature of radiography and also the importance of patient-centred care and a caring environment (Lundgren et al., 2015).

An analysis of theses from an academic perspective can provide a window into the state of the discipline. Since the academic orientation should focus on the essential terms of science, research, theory and analysis, an exploration of trends within theses can be a powerful tool for understanding what students and their faculty supervisors are interested in. Additionally, Ahonen (2008) also has expressed concern that little work was being done regarding the theoretical foundation of radiography. Exploring the theoretical perspective might suggest what the discipline's culture is, and can give an indication of what theories belong to the discipline (Samara, 2006). Therefore, investigating the theoretical foundations of theses will show how the students have understood radiography as a subject. Recognizing and understanding the trends in Bachelor theses in radiography are important for at least two reasons. Knowing the trends in radiography theses can help students to better frame their own subject. Moreover, understanding those trends gives insight into the existing knowledge base. To the best of our knowledge, no research on radiographic theses has been done to date. The aim of this study was to explore the contemporary theoretical, topical and methodological trends in Bachelor theses in the field of radiography.

3. Methods

3.1. Design

An explorative design with a qualitative approach was adopted to investigate Bachelor theses' in radiography theoretical, topical and methodological tendencies (Polit & Beck, 2008).

3.2. Data Collection

The sample consists of Bachelor theses in radiography education obtained from the Swedish National Agency for Higher Education, which collected the theses for the national evaluation of quality assurance of radiographic programs in Sweden in 2013. The theses were sent to the National Agency for appraisal of how well the students achieved the objectives defined in the qualification descriptors leading to the award of a general qualification, a Bachelor's degree in radiography and not an appraisal that constitute any review of the grading given by the examiners (The Swedish National Agency for Higher Education's Quality Evaluation System 2011-2014). The educational programs were required to send in a random selection of each diagnostic radiography program that had radiography as the major subject. Contact was established with the Swedish Higher Education Authority. A request was made to have access to all students' Bachelor theses that had been assessed during the evaluation period of the radiography program. A formal approval of an ethics committee was not required, according to the Swedish Act on the Ethical Review of Research (Ministry of Education and Research, 2003) since the theses are public documents and no handling of sensitive personal data occurred, the theses were anonymous with respect to the name of the author, supervisor, examiner and institution. The theses were obtained from four universities and one University College in Sweden. In all, 36 Bachelor theses were obtained.

3.3. Methods of Data Analysis

Content analysis (Hsiu & Shannon, 2005) was employed to determine which theoretical framework, topics, research questions and designs and methods that were addressed in the Bachelor theses in radiography. Content analysis allows interpretation and understanding of both the manifest and latent content of the data (Sandelowski, 2004). For this study, abstracts alone were insufficient for the desired analysis; full-text manuscripts were needed. Each manuscript was read and coded by the authors. All research questions were extracted from the manuscripts and analysed using open coding. The coding attempted to capture the breadth of ideas and topics addressed, and main topics were generated based on the research questions. Some manuscripts addressed more than one topic. All principal topics addressed and methods used in each study were included. The manuscripts were then analysed according to data collection and analysis methods utilized (Hsiu & Shannon, 2005; Sandelowski, 2004). The theoretical framework that provided background or context was obtained and categorized using open coding.

3.4. Findings

The present study will address theoretical framework, topical and methodological trends in Bachelor theses in radiography.

3.5. Theoretical Framework in the Theses

To see what theories or concepts are used as a theoretical framework, the theses and the theoretical reference were systematically reviewed to get an overview of the theoretical and disciplinary orientation. The type of literature being referred to in the theoretical framework usually includes a review of research, conceptual literature, course literature, non-research based reports, legal or official materials in the field of study in question. Literature from different disciplines and a combination of different theoretical origins dominate. The main areas of theoretical literature used are nursing, technological, medical and social science and to a lesser extent to the discipline of radiography. This may be interpreted as limited access to research from a radiographic point of view. On the whole, the theses gave an impression of a discipline with a great deal of imported knowledge, showing a theoretical pluralism.

3.6. Contemporary Trends in Radiography Thesis Topics

Contemporary trends in topics include a wide range of different radiographic areas and interventions. The analysis of research questions yielded four trends in topics and associated sub-topics: evidence based care, evidence behind imaging, work environment and additional minor trends.

3.7. Evidence Based Care

The theses that addressed evidence based care included sub-topics such as evidence based conduct, improving patient comfort and improving patient safety.

3.8. Evidence Based Conduct

The theses that addressed evidence based conduct chose specific situations in which to search for evidence-based studies of particular interest to the radiographer. The purpose was to search for ways to handle specific patients or situations or to examine radiographers' knowledge in selected specific situations. They searched for knowledge about general guidelines on the management of patients. Some theses also focused on patients' and radiographers' experiences and perspectives of feelings and encounters with children, patients with cancer and the elderly. Exploring attitudes towards research showed that radiographers favoured research about technical aspects and considered these technical efforts to be nursing actions. They also examined attitudes to image optimization, safer radiation and faster radiographic examination methods.

3.9. Improving Patient Comfort

Improving patient comfort dealt with subjects such as music as a reducer of patients' anxiety during angiogra-

phy. Findings showed an awareness of how important it is for the patient to have an influence on the selection of music. Another subject was non-pharmacological factors that can ease the experience of children undergoing magnetic resonance examinations. Information to youths of 13 - 16 years must be available on the internet, preferably with stories from other teens who have completed the examination.

3.10. Improving Patient Safety

Improving patient safety included subjects such as factors preventing risks of injuring patients with pacemakers during magnetic resonance examinations. In terms of radiographers' reasoning regarding child abuse, the radiographers stated, that they lack sufficient knowledge. One thesis investigated deficiencies in incoming data in X-ray referrals, indicating a high frequency of referrals lacking justification with regard to the requested examination. Another thesis aimed to assess the state of knowledge of computer assisted image review in mammography screening with direct digital technology.

3.11. Evidence behind Imaging

The theses that addressed evidence behind imaging included sub-topics such as minimizing radiation to patients and staff, comparing imaging methods for various diagnoses and comparing modalities for various diagnoses.

3.11.1. Minimizing Radiation to Patients and Staff

The theses that addressed minimizing radiation included various aspects of radiation safety such as how technical measures can minimize the radiation dose at conventional radiography, and physical radiation protection and its impact on radiation dose and image quality. The theses explored how it is possible to minimize the radiation dose to children in conventional radiography by creating a trusting relationship and using different deflection methods. It was also studied how radiographers, through nursing documentation and technical measures, for example choice of parameters and protocols, can lower the dose of radiation in computer tomography examinations. Moreover, there were discussions of the proportion of requests in the case of pulmonary embolisms that are unjustified according current guidelines. One thesis aimed to highlight exposure of the staff to radiation during position emission tomography/computer tomography examinations.

3.11.2. Comparing Imaging Methods for Various Diagnosis

The overall focus in theses addressing imaging methods was on gaining knowledge about the technological developments in various new methods. Tomosynthesis, automated ultrasound and MRI were compared to digital mammography in the search for the best method in order to diagnose breast cancer at an early stage. Since magnetic resonance imaging is widely used as a diagnostic tool for multiple sclerosis, in one thesis the purpose was to explore whether there were sequences that were better than others for diagnosing multiple sclerosis. Another thesis dealt with underlying reasons for the choice of method when performing a postoperative control of the knee, depending on the resources of the radiology department.

3.11.3. Comparing Modalities for Various Diagnosis

The theses that addressed comparing modalities for various diagnoses set out to find which modality is most appropriate at different diagnoses and the best diagnostic outcomes. One thesis examined Alzheimer's disease at an early stage; each method's level of specificity or sensitivity when using different diagnostic modalities was discussed. Another thesis sought knowledge regarding the effectiveness of magnetic resonance tomography as a method for early diagnosis of breast cancer in women with specific gene mutation. The difference between computer angiography and lung scintigraphy during pregnancy with respect to the radiation dose to the foetus was also investigated.

3.12. Work Environment

The theses that addressed the work environment included sub-topics such as communication and digital development, possibilities and limitations, and preceptor and preceptorship during students' clinical practice.

3.12.1. Communication and Digital Development-Possibilities and Limitations

The theses that addressed communication, digital development and the work environment set out to find which

factors enhance and which factors decrease job satisfaction among radiographers. The radiology department's digital development was explored with a focus on quality assurance, work environment and the future development of the profession. Radiographers' experience of communication and expectations of establishing a new communication model at the radiology department was also explored.

3.12.2. Preceptor and Preceptorship during Students' Clinical Practice

Students' work environment regarding the perspective of preceptor and preceptorship during clinical practice was investigated by a systematic literature review. The thesis concluded that supervisors need training and that allocating more time may improve future tutoring for students during the placement.

3.13. Additional Minor Trends

The theses that addressed minor trends included sub-topics such as ethical perspectives and gender differences.

3.13.1. Ethical Perspectives

The thesis that addressed ethical subjects aimed to describe radiographers' perception of ethics in practice. Two different perceptions were identified, one that stated that ethics in practice has to do with good patient care, while the other stated that technical efforts related to improving patients' imaging diagnosis is ethics in practise.

3.13.2. Gender Differences

One thesis aimed to identify and present how the radiographers perceive the gender issue in their profession. The findings show that male radiographers enjoyed a higher degree of self-esteem. They were more interested in reaching status, career and a higher salary, and their way to these goals was much shorter than their female colleagues.

3.14. Epistemological Trends

The predominant research designs used involve literature reviews for Bachelor theses. It can be suggested that the motive for this design is to investigate the current scientific status in the chosen subject. The students used qualitative, quantitative and combination of methods, whereas quality content analysis holds an exceptional position for analysis (**Table 1**). The literature reviews were based on published, peer-reviewed journal articles, and the number of articles as primary sources varies from five to 28 with a median of 12. Furthermore, the primary sources were quality evaluated according to quality review protocols depending on the methods used and the sampling frame. The primary sources were scrutinized according to criteria such as described purpose, sample, methods of measurement, analysis and whether there was an ethical discussion or whether an examination had been performed. Most theses based on literature reviews use quantitative articles as the primary sources. Some theses are based on interviews; it can be suggested that the motive for using interviews as a principal source can be the desire to capture the experiences and of various groups of practitioners. The number of informants included varies from five to 20 informants with a median of nine.

Moreover, the aims of the theses can be judged as descriptive, according to Blooms taxonomy, since the theses have attempted either to highlight, examine, describe, identify, compile, clarify, view or study various subjects. No analytical aims were found. Theses' reference lists have also been analysed with respect to the number of references in languages other than Swedish. The number of references in English ranged from three to 47 references, with a median of 24 references.

Table 1. Data collection methods and analysis technique in Bachelor theses.

Data collection method	Number of theses	Target group Subjects involved	Quantitative method	Qualitative method	Mixed method	Non-empirical
Interviews	14	Radiographers radiologists	1	13		
Literature reviews	22				1	21
Documents	1		1			

4. Discussion

The aim of this study was to explore the contemporary theoretical, topical and epistemological trends in Bachelor theses in the field of radiography. The thesis gives the student an award of a general qualification, a Bachelor degree. The intention to investigate these trends was to fill the gap caused by a lack of empirical studies that investigate these trends. Our analysis shows that the literature review has a dominant position, and the theses can therefore be described as having an academic orientation since the literature review has been categorized as a theory-oriented approach. The characteristics of a literature study are to have a subject as the point of departure, to make a theoretical exploration and to search for scientific articles about the subject (Meeus et al., 2004). It is particularly through these article references that students come into contact with the primary scientific texts and the theses can therefore be suggested to be grounded in scientific research.

The theoretical framework to a relatively large extent refers to material included in the radiographic education, to policy documents and to a certain extent to the literature on concepts, although more rarely to theories. The trend that has emerged is that the theoretical framework is pluralistic, with literature from nursing, technological, medical and social science, showing the subjects' interdisciplinary nature. According to the Swedish national agency for higher education (SFS, 1993: 100 Higher Education Ordinance) the Bachelor theses should deepen students' knowledge in some area within the main subject. However, a question that can be discussed is the quality of the knowledge base, since there are theses that mainly base the theoretical framework often are founded on basic education literature that can be expected to have been included and examined in previous courses, which may counteract the possibility to broaden and deepen the study.

When the topics were characterized, the focus was deemed to be on a micro level, addressing issues of caring for specific areas/patients, specific modalities and related models, and on a meso level, focusing on organization issues and work environment (Dellgran & Höjer, 2015). Some of the topics addressed can be judged as useful instrumental knowledge, when the intention is to find and present concrete practical application in practice, such as when clinical guidelines are investigated (Dellgran & Höjer, 2015), such as the handling of patients with resistant bacterial infection or guidelines concerning the use of computer examinations. There are also topics that have a more conceptual orientation, to acquire knowledge about and to investigate how patients and radiographers think and experience different situations and subjects. Most topics are inquiring subjects that could be useful and to some extent be applied directly in radiography practice. Only two theses address more theoretical knowledge, such as ethics and gender.

Our findings show that the students are able to search and identify published scientific articles relevant to the selected problems and can distinguish between scientifically acceptable and unacceptable sources. Since the theses are essentially literary studies, based on scientific articles, it can be suggested that the students come into contact with international research since references in a language other than Swedish are predominant. In view of this, it appears that the link to research in radiography education is strong. In addition, one can assume that the students have obtained an experience of reading and reviewing scientific literature and thereby acquired a scientific approach. Even if the theses predominantly have a theoretical approach, it can be suggested that the radiographers in their profession are to some extent prepared to work evidence based, which requires an ability to read, critically evaluate and search for relevant knowledge (Lundgren & Robertsson, 2013; Gallart et al., 2015).

An established research method is used for the analysis of scientific articles, namely content analysis, regardless of whether the theses are based on quantitative or qualitative articles or interviews. This seems appropriate for the material. When studying formulations of the aims, the results showed an overrepresentation of descriptive aims rather than analytical aims, and it follows that the theses are descriptive. While there is value in conducting descriptive studies, it could be argued whether it is adequate or if it is desirable to achieve a more analytical level. This might be accomplished with more tutor support, considering that the Bachelor theses are mostly a first time scientific work.

There is a fundamental difference between a professionally oriented thesis and an academically oriented thesis. The difference is the integration of scientific and professional expertise, which, it is claimed, is something central to professional programmes, since this involves both the skills to write a sustainable argument with a scientific approach and at the same time respond to professional practice (Svärd, 2013; Gallart et al., 2015). This dichotomy of academic-professional orientations is further emphasized by Meeus et al. (2004) in investigating teacher education where the theory oriented approach was questioned with the argument that there is a need for

a more practice oriented approach that can be a bridge between the Bachelor's degree programme and the work market. The conclusion was that theory and practice orientations are two extremes on a continuum.

5. Conclusion

Our findings show that the contemporary trends in the Bachelor theses' theoretical framework show a theoretical pluralism and a great deal of knowledge import originating from the nursing, technological, medical and social sciences. Regard trends in topics, a wide range of different radiographic areas and interventions were investigated. The analysis of research questions yielded four topics: evidence based care, evidence behind imaging, work environment and additional minor trends. The predominant research design involves a literature review of the chosen subject, and the motive is to investigate the subjects' scientific status. The literature reviews were based on published, peer-reviewed journal articles in languages other than Swedish and the articles were quality evaluated according to quality review protocols. Some theses are based on interviews, and the motive for using the interview can be the desire to capture the experiences and opinions of various groups. The methods used were qualitative, quantitative and mixed methods. The most widely used analytical method was qualitative content analysis. The theses can be judged as descriptive. The academically oriented theses should focus on knowledge of the subject, and it can therefore be claimed that the analyses of Bachelor theses have provided a window into the state of radiography and can thereby have an impact of the development of radiography as a discipline.

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